Climate change and water sources in Arctic streams; effects on physiochemical variables and biotic communities.

*Milner Alexander[1]、Blaen Philip J. [1]、Docherty Catherine L.[1]、Brown Lee E[2]、Khamis Kieran[1]、Hannah David M.[1]
*Alexander Milner[1], Philip J. J. Blaen[1], Catherine L. Docherty[1], Lee E Brown[2], Kieran Khamis[1], David M. Hannah[1]

1. University of Birmingham, UK、2. University of Leeds, Leeds, UK
1. University of Birmingham, UK, 2. University of Leeds, Leeds, UK

In Arctic regions climatic change is modifying the relative contributions and temporal dynamics of water sources (rainfall, ice-melt, snowmelt, and groundwater) to river flow. These changes will have significant implications for physicochemical habitat and associated biotic communities. Aquatic systems downstream of glaciers may shift from one of a deterministic nature to one with greater stochasticity, both in terms of their physicochemical variables, associated biological communities and functional trait composition. Nutrient uptake experiments in Svalbard streams indicated most rivers exhibited a low demand for NO_3 and PO_4 but demand for NH_4 and acetate was more variable and in several rivers comparable to sub-Arctic regions. Similar experiments in northeast Greenland showed NH_4 and acetate were the highest in demand but uptake was low compared to Svalbard and other Arctic and sub-Arctic regions. However, diffusing substrate experiments in Greenland streams showed highest primary productivity when NH_4 and PO_4 were added simultaneously, with autotrophic community productivity increasing more than that in heterotrophic communities. These data suggest NH_4 retention and uptake may be facilitated by labile dissolved organic carbon availability in these streams, which may increase with climate change with release from permafrost. Evidence from a number of Arctic and also alpine studies indicates reductions in glacial meltwater runoff are expected to drive an overall increase in local alpha diversity and abundance, but a decrease in regional diversity and rareness as specialist cold water taxa become extinct. Our understanding of potential ecological tipping points and associated indicator taxa is limited but data from a number of regions have identified threshold changes in community composition of stream taxa at <5.1% glacier cover and <66.6% meltwater contribution. An unexpected impact of glacier volume loss has been the liberation of contaminants, including pesticides and other persistent organic pollutants, from the early industrial revolution and onwards. A recent concern has been regarding uncertainty in how climate change is shifting these contaminants from glacial stores to other ecosystems, with potential detrimental effects.

©2017. Japan Geoscience Union. All Right Reserved.